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# N.E.R.T.

## Nurturing ECSU Research Talent Elizabeth City State University



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### Summer 2000 Research Abstracts and Program Highlights

#### **Geospatial Visualization for Transportation Engineering: Interpreting the Best Location for an Interstate Highway Truck Safety and Weight Enforcement Facility**

Researcher: Keisha Harrison, SR/CS  
Mentor: Dr. Timothy Olsen,  
Univ. of Wisconsin- Madison, ARC



Keisha became a member of the remote sensing commercialization NASA-supported Affiliated Research Center (ARC) project team when she arrived and began to work on visualizations developed from digital elevation models (DEMs) downloaded from the US Geological Survey (USGS), Landsat-7 multi-spectral data from July of 1999, and county aerial orthophotography. These visualizations were created to be used for planning and decision-making by a engineering firm contracted to the DOT. The goal was to select the best site for a new Safety and Weight Enforcement Facility along a section of Interstate-90. The visualization challenge was to present complex geospatial data meaningful to decision-makers, in a manner that would enhance engineering decisions and enable meaningful participation by the general public during open hearings. As part of an ARC project, the fly through visualizations contributed towards the commercial viability of remote sensing data and technology.

#### **Three Dimensional Models From 2-D Photos**

Researcher: Golar Newby, SO/CS  
Mentor: Edward Swan II, ONR  
Naval Research Lab



The internship project at the Naval Research Laboratory, involved researching the development of 3 Dimensional models from 2 Dimensional pictures. Software packages used include, but are not limited to were Canoma by Meta Creations, and Photo Modeler Lite which was developed by EOS Systems Inc. The purpose of this research is to find ways to form accurate 3D models that can be measured for errors and measured for length given a certain scale. The model should then be able to be saved in an Open GL format or VRML format so that another computer can understand the geometry and texture of the 3 dimensional object. The project also involved study of the most common type of lens distortion encountered, barrel type. Barrel lens distortion causes the image to bend out, which causes the image to curve much the same way as a barrel. With the evaluation of Canoma and Photomodeler Lite I was able to determine that Photomodeler Lite was geared much more towards the project and would better benefit someone modeling. With the upcoming release of Photomodeler Pro 4.0 it would better benefit the project.

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## **Investigations of a Toy Model of Dark Matter Clustering**

Researcher: Shayla Brooks, SO/CS

Vincent Davis, SO/Physics

Mentor: Dr. Donald K. Walter, Center for Network Research & Training (CNRT) at SCSU



The growth of dark matter clusters in the early universe is investigated by using a two-dimensional toy model developed by Krauss and Starkman. The model is implemented in the Mathematica software so that the variation of model parameters can be understood visually. Effects investigated include expansion, growth of the horizon, and free-streaming. Because dark matter is thought to be the seeds for the formation of galaxies, the correlation function for a set of model parameters is calculated and compared with that determined from an actual galaxy catalog. The project also included understanding Optical Astronomy, Stars, ASTROIP, UNIX.

## **Light Detection and Ranging (LIDAR) Technique for observation and Location of Greenhouse and Trace Gases.**

Researcher: Torreon Creekmore, SO/CS

Mentor: Dr. Thomas Chyba, Research Center for Optical Physics, Hampton University



Light Detection and Ranging (LIDAR) is a powerful tool for understanding and studying the Earth's atmosphere. The use of lasers in remote sensing helps scientist to take advantage of the unique attributes of laser light to measure properties of the Earth's atmosphere. LIDAR consists mainly of a laser, telescope receiver, and computer data analysis system. Within this, research project experiments were performed to demonstrate the fundamentals of lasers. A new

pulse laser was characterized and evaluated for use in a mini-LIDAR system. A small telescope and computer data acquisition system were used to make preliminary measurements. The project started with hard target measurement and proceeded to aerosol measurements. Part of the project involved aligning a plasma tube containing Helium-Neon gas and two resonator mirrors to make a laser.

## **A Study of the Spiral Galaxy M101**

Researcher: Katrina Banks, SO/CS

Issac Lister, SR/Math

Mentor: Dr. Donald K. Walter, Center for Network Research & Training (CNRT) at SCSU



Summer research involved investigation of the spiral galaxy M101. The task included processing and examining images of this object taken from the ground using narrow-band interference filters centered on wavelengths of several bright nebular emission lines. The study also included examining emission from both high and low ionization ions, O++ and N+ respectively. The presence of HII regions in the arm as well as the ionization structure across the galaxy is discussed.

## **Long-term Nearshore Field Experiment**

Researcher: Earnest Walker, SR/CS

Mentor: Dr. H. Pendharkar,  
ECSU Math & Computer Science Dept.

The Long-Term Nearshore Field Experiment is an ongoing project to implement a web-based data-handling system to compile and archive primary data sets from the DUCK94 field re-

search facility. DUCK94 data is the most comprehensive measurement of the dynamic nearshore data ever collected. In alliance with scientist worldwide, it addresses effects of the ocean carbon cycle on the atmosphere—utilizing a total of 19 organizations it conducts 31 experiments involving 100 scientist, technicians, and students. The focus of the Elizabeth City State University team from the Mathematics and Computer Science Department in partnership with the Coastal Hydraulics Laboratory Field Research Facility, was to make the accumulated data available online in useful online formats.



Focusing the data of small and medium scale sediment transport, morphology, wave shoaling, wave braking, nearshore circulation, and sediment motion accomplished this task. The team's ultimate goal was to transform the data collected from its original state to a format utilizing Perl, Matlab, and HTML. Once the appropriate format was conformed, it was then placed on the JGOFS server for Internet use.

#### **A Study of North American Monsoon System (NAMS) Using SuperCalc4.**

Researcher: Joseph Gale SR/CS  
Mentor: Dr. Wayne Higgins  
Howard University

The North American Monsoon System (NAMS) greatly affects climate variability in the continental United States. Finding out exactly how the NAMS affects the climate will allow better prediction of future climate conditions. It is imperative that the NAMS is further researched in order to establish its climate predictability value. Precipitation and surface temperature data has been collected from weather stations all over Mexico for the years from 1990 to 2000. This data will be combined with that of the Southwest



combined with that of the Southwest U.S., for the same time period, to be analyzed. The raw data was received in .cal and .csv format. The .cal files are converted to .csv files using an application called SuperCalc4. Using another application, all of the files were converted to .asc format. A C-program was designed to scan through each file searching for missing values to be replaced and to create a new file, which was in a more proper format for analysis. The data was processed using the Cressman Analysis technique.

#### **Methods of Solving Systems of Equations**

Researcher: Melvin Lee Mattocks, JR/CS  
Mentor: Johnny L. Houston, PhD  
ECSU Math and Computer Science Dept.

A system of equations is written in the form

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + \dots + a_{1n}x_n = b_1$$

$$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 + \dots + a_{2n}x_n = b_2$$

$$a_{n1}x_1 + a_{n2}x_2 + a_{n3}x_3 + \dots + a_{nn}x_n = b_n$$

where  $a_{ij}$  represent the coefficients of the system,  $b_i$  represents the right-side elements of the systems, and  $x_1, x_2, x_3, \dots, x_n$  represent the unknowns. To simplify the system we can write it in matrix-vector form. The coefficients  $a_{ij}$  can be used to form an  $n \times n$  matrix, where there are  $n$  columns and  $n$  rows. The unknowns,  $x_1, x_2, x_3, \dots, x_n$ , along with the right-side elements  $b_i$ , can be placed in an

$m \times 1$  matrix. This system of equations can be rewritten as  $Ax = b$ ,

where  $A$  is the matrix of the coefficients,  $x$  is the matrix of the unknowns, and  $b$  is the matrix of the right-side elements. A solution for this system is a set of specific values for  $x_1, x_2, x_3, \dots, x_n$  that will make each of the equations a true equality. Systems of equations are solved by many methods. The Gaussian Elimination method is the most well known. This project, investigates the Gaussian Elimination method as well as some specialized methods such as LU (Lower Upper) factorization and Cramer's Rule, as well as some iterative methods such as the Jacobian Method, Gauss-Seidel Method, and the S.O.R. (successive over-relaxation) Method. Computer programs in C++, to solve the equations, were also developed for each of the methods.



## VRML and \*.wrl Class Files

Researcher: Je'aime Powell SR/CS

Mentor: Simon Julier, ONR Naval Research Lab

The task involved creation of a working API which will automatically convert files from VRML class files into OpenGL linklists or C code files for implementation into the GRATO. OpenGL is a cross platform graphics rendering package. It is mostly used for ultra realistic landscapes. The GRATO uses OpenGL to display both reality based landscapes and any man made added features. Specific on the GRATO can be found at the AIT web site which is <http://www.ait.nrl.navy.mil>. The most common OpenGL seen by users can be found in Direct X enhanced games for the PC. It is a very powerful package. The OpenGL website (<http://www.opengl.org>) served as a reference on the powerful package and implementation of software development. The research continued with a focus on the functions of VRML and its \*.wrl class files. One main difference between OpenGL and VRML is the way the textures and object are defined. VRML has shapes built in while OpenGL's linked lists are long an cumbersome sets of instructions. One program was identified with the ability to import wrl files and export c files which can be compiled and run using OpenGL. The program's name is "3D Explorer" by Xdsoft.



Dr. Hayden is shown with researchers during UNIX Operating System Training.

## Development of an e-mail Notification for Wireless

Researcher: Katrina Godwin, GRAD/CS

Mentor: Joann Ordille, Lucient Technologies- Bell Labs

The research project focused on wireless technology and the construction of an e-mail notification program in the C programming language for UNIX that could be used for wireless application. Circular buffers were investigated as well as Bluetooth wireless technology. A circular buffer program was written to prepare for the e-mail notification program. The e-mail notification program was designed to perform a search for a keyword in the Associated Press newsfeed. Once the keyword was found in an article, an e-mail notification with the title of the article was sent to a specific e-mail address. The program used the UNIX Mail command and the system() function. Katrina is now a graduate student at Howard University.



## Three - Dimensional Battlefield Simulation of Realtime Kosovo (1999)

Researcher: Donald Charity, GRAD/Math

Mentor: Dr. Rob King, ONR-NRL

With the Kosovo crisis, the project assigned for research was a Three - Dimensional battlefield simulation of realtime Kosovo. This project will be used for demonstrations at NRL's Virtual Reality Lab. The tools used to complete this project were MultiGen II, a realtime 3D modeling software used to generate the terrain, ARC Digitized Raster Graphics, satellite collected images of the Kosovo terrain, DTED Digital Terrain Elevation Data on CD-ROM, along with several other application programs used to generate the desired terrain for viewing. Donald is now a graduate student at Howard University.



## 2000 - 2001 PHOTO HIGHLIGHTS ...



The Office of Naval Research-Nurturing ECSU Research Talent program involves

undergraduate mathematics, computer science, physics, and technology majors in academic year team research activities. Research training meetings began in early September and are held every Tuesday and Thursday 5-8 PM through Mid April. Research training meetings start with a 20-30 minute announcement period during which time students learn about internship opportunities, hear program announcements, give team reports, discuss travel logistics and goals of the program. Following the announcement period, students meet with faculty mentors or attend training on tools used for research. In addition, students spend 20 hours/week in the undergraduate research computer laboratory completing task sheet requirements and research assignments. The closing program will be held on two nights in April. During the closing program, students make oral presentations of their research training activities. All research teams are also required to complete written reports and to maintain a team webpage. Shown above are scenes from the announcement period and Dr. Stephanie Johnson (student advisor). Shown below are scenes from the research training.



## 2000 - 2001 ENTERING FRESHMEN



Seward, Carl



Smith, Eunice



Booth, Cedric



Harrell, Paula



Blakeney, Dionne



Gilchrist, Willie II



Lee, Kenyatta



Fleetwood, Darius



Reid, Shawneque



Veale, Nelson



Griffin, William



Turner, Patrice

## Dates to Remember.....

- \* HTML Training Sept. 14 & 19, 2000
- \* Women Of NASA Satellite Webconference Sept. 27, 2000 and Oct. 5, 2000
- \* Photoshop Training Oct. 3 & 5, 2000
- \* ETS Graduate Record Examination Workshop Oct. 5-8, 2000
- \* Celebration of Women in Mathematics Oct. 17, 2000
- \* National Technical Association Conference & Career Fair, Oct. 18-21, 2000
- \* UNIX OS Training Oct. 10 & 19, 2000
- \* ECSU National Training Conference Oct. 23-25, 2000.
- \* Satellite Imagery Training Oct. 24, 26, 31 and Nov. 2, 2000
- \* Election Day Nov. 7, 2000
- \* Internship Roundtable Nov. 9, 2000 2 - 3:30 PM 116 LH
- \* Report on assigned research articles Nov. 30, 2000
- \* GaTech Graduate School Focus Jan. 13 - 16, 2001
- \* Association for Computing Machinery SIGCSE Conference Feb. 21-25, 2001
- \* NAFEO High Tech Undergraduate Research Expo March 19-24, 2001
- \* Final Research Team Oral Reports Apr. 12 and 17, 2001 5-6:30pm 116 Lester Hall

## 2000 - 2001 UNDERGRADUATE STUDENT RESEARCHERS



Joseph  
Gail sr/cs



Keisha  
Harrison sr/cs



Ernest  
Walker sr/cs



Issac Lister  
sr/math



Je'aime  
Powel sr/cs



Davis, Vincent  
so/physics



Bernard  
Bailey jr/tech



Gregory  
Lassiter jr/cs



Melvin  
Mattocks jr/cs



Gregory  
Williams Jr. so/cs



Elizabeth  
Rascoe so/cs



Loretta  
Barnes jr/cs



Golar  
Newby so/cs



Torreon Creekmore  
so/physics



Katrina  
Banks so/cs



Shayla  
Brooks so/cs



Ramatoulie Bah  
so/physics & cs

## 2000 - 2001 RESEARCH MENTORS



Top-Left Dr. Hemant Pendarkar (System Administration), Mrs. Wanda Hathaway (Visualization). Bottom-Left Dr. Georgia Lawrence (Mathematics), Mr. Jeff Wood (Multimedia). Seated are Mr. Robert Harris (Networking), Mr. James Swimpson (scholarships), Dr. Latif Choudhury (Physics).



## 2000-2001 RESEARCH TEAMS ...

<u>Team Name</u>	<u>Mentor(s)</u>	<u>Team Members</u>
System Admin	Dr. H. Pendharkar	Golar Newby, SO/CS Patrice Turner, FR/CS Willie Gilchrist, FR/CS Paula Harrell, FR/CS
Satellite Imagery	Mrs. W. Hathaway	Keisha Harrison, SR/CS Cedric Booth, FR/CS William Griffin, FR/CS Dionne Blakeney, FR/CS Elizabeth Rascoe, SO/CS
Networks	Mr. R. Harris Dr. L. Hayden	Joseph Gale, SR/CS Gregory Lassiter, JR/CS Ernest Walker, SR/CS Loretta Barnes, JR/CS Gregory Williams, SO/CS
Mathematics	Dr. G. Lawrence Dr. L. Hayden	Carl Seward, FR/Math Shawneque Reid, FR/Math Eunice Smith, FR/Math Kenyatta Lee, FR/Geoscience Issac Lister SR/Math
Physics	Dr. L. Choudhury	Torreon Creekmore, SO/Phy Vincent Davis, SO/Phy Ramatoulie Bah, SO/Phy & CS Katrina Banks, SO/CS Nelson Veale, FR/CS Darius Fleetwood, FR/Phy
Multimedia	Mr. J. Wood Mrs. B. Washington	Je'aime Powell, SR/CS Bernard Bailey, JR/Tech Shayla Brooks, SO/CS Melvin Mattocks, JR/CS

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